

## School of Mathematics

**Module MA1S12 — Mathematics for Scientists (second semester)** 2010-11  
 (JF Mathematics as a whole subject within the Science Moderatorships. JF Human Genetics. JF Computational Chemistry. JF Medicinal Chemistry. JF Physics & Chemistry of Advanced Materials. )

**Lecturer:** Dr. Derek Kitson and Dr. Colm Ó Dúnlaing

**Requirements/prerequisites:** MA1S11.

**Duration:** Hilary term, 11 weeks

**Number of lectures per week:** This is the second semester module of a two semester sequence. It continues from module MA1S11 in the first semester. (MA1S11 and MA1S12 each have 10 ECTS credits. There will be separate results for MA1S11 and MA1S12, weighted as 10 credits each, and compensation rules will apply according to the degree programme.) For the second semester, there will be 6 lectures and 2 tutorials per week.

**Assessment:** Assignments and tutorial work will count for 20% of the marks, There will be final examination in June counting for the remaining 80%.

**ECTS credits:** 10

**End-of-year Examination:** Three hour exam.

**Description:**

### Calculus with applications for Scientists

The lecturers for this part will be Dr. Derek Kitson.

The main textbook will be [Anton] and the syllabus will be approximately Chapters 5, 7-10 of [Anton] plus a brief introduction to partial derivatives (sections 13.1, 13.3 of [Anton]).

Chapter headings are

- Applications of the definite integral in geometry, science, and engineering;
- Principles of integral evaluation;
- Mathematical modelling with differential equations;
- Infinite series;
- Parametric and polar curves

### Discrete Mathematics for Scientists

The lecturer for this part will be Dr. C. Ó Dúnlaing.

- *Linear algebra* This reference for this part of the course will be [AntonRorres]. For 2010–11 the syllabus will be approximately chapters 2, 5, section 4.2 and a selection of application topics from chapter 11 of [AntonRorres].

- Determinants, evaluation by row operations and Laplace expansion, properties, vector cross products, eigenvalues and eigenvectors
  - Introduction to vector spaces and linear transformations. Least squares fit via linear algebra.
  - Differential equations, system of first order linear equations, linear second order equations;
  - selected application in different branches of science.
- *Probability*. Basic concepts of probability; Sample means; Expectation and standard deviation for discrete random variables; Continuous random variables; Examples of common probability distributions (binomial, Poisson, normal) (sections 24.1–24.3, 24.5–24.8 of [Kreyszig]).

### *Essential References*

[**Anton**] Combined edition :

Calculus : late transcendentals : Howard Anton, Irl Bivens, Stephen Davis. Combined 9th ed; Publisher New York : Wiley, c2010). [Hamilton 515 P23\*8;2]

or

Calculus : single variable / Howard A. Anton, Irl Bivens, Stephen Davis. 9th ed. 2009 [Hamilton 515 P2\*8;4, S-LEN 515 P2\*8]

[**AntonRorres**] Howard Anton & Chris Rorres, Elementary Linear Algebra with supplementary applications. International Student Version (10th edition). Publisher Wiley, c2011. [Hamilton 512.5 L32\*9;-5, S-LEN 512.5 L32\*9;6-15]

### *Recommended references*

[**Kreyszig**] Erwin Kreyszig, Advanced engineering mathematics (9th edition), Wiley, 2006 [Hamilton 510.24 L21\*8, S-LEN 510.24 L21\*8]

[**Thomas**] Thomas' calculus. Author Weir, Maurice D. Edition 11th ed / based on the original work by George B. Thomas, Jr., as revised by Maurice D. Weir, Joel Hass, Frank R. Giordano Publisher Boston, Mass., London : Pearson/Addison Wesley, c2005. [Hamilton 515.1 K82\*10;\*]

January 14, 2011